

in this particular animal. The posterior edge of the collar was higher than the anterior one, and when both "rhinophores" were retracted this posterior border of the collar was folded over the anterior edge in such a way as to lead to the appearance of two minute openings into the single pocket.

Agar's Island, Bermuda.

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DESCRIPTION OF FIGURES, Plate VI.

- FIG. 1. Branching gills.
- FIG. 2. Ridges about the branchial collar; *a*, anterior; *b*, posterior; *c*, branchial collar (gills not shown); *d*, triangular depressions.
- FIG. 3. Lobed condition of the buccal veil.
- FIG. 4. A bifurcate rhinophore; *c*, collar of rhinophore.
- FIG. 5. Fused rhinophoral pockets; *a*, rhinophores extended; *b*, retracted.

A METHOD OF PRESERVING LARGE NUDIBRANCHS.

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Those who have had occasion to study collections of nudibranchs, especially when they include specimens of the larger tropical species, have doubtless often wished that the organisms submitted for their examination had been so preserved as to exhibit in more natural fashion the appearance of these creatures when alive. After various attempts to secure good preparations, I find that the simple procedure herein outlined gives tolerably fair results. The method has been tried almost exclusively upon *Chromodoris zebra*, but it seems likely that other large forms will yield equally good preservations when treated in the same way.

A saturated solution of cocaine hydrochloride is made up in sea water, and 2-3 cc. of this solution is then injected into the

heart (or into the region of the heart) of *Chromodoris* by means of a syringe and hollow needle. A "Record" syringe, such as is used by surgeons, is useful for this purpose. Within an hour or so—depending on the temperature, on the size of the animal, and on the exact amount of the narcotic that has been injected—the nudibranch will be fully anaesthetized, usually with the gills and rhinophores fully extended; frequently also the genital papilla will be protruded, and the pharynx everted. It is advantageous to add a few crystals of chloretone to a small volume of sea water containing the nudibranch; furthermore, several injections of the cocaine may sometimes yield a better result than a single dose.

When completely anaesthetized, the animal may be killed and fixed in 75 per cent. alcohol. Precipitated slime, on the surface of the body, can be subsequently removed with a camel's hair brush. In order to avoid the distortion which inevitably results if these large nudibranchs are fixed while they rest upon the bottom of a dish, it is well to suspend them vertically in the fixing fluid until they are killed and begin to harden. This may be done by gripping the caudal extremity of the foot between the jaws of a light "artery clamp" or some similar instrument; or a thread may be sewn through the foot for this purpose.

The injection of a relatively small amount of a narcotic usually gives much better results than does the attempt to anaesthetize these nudibranchs by adding magnesium sulphate, or chloretone, to the seawater containing them. In the latter method, not only does the surface frequently become covered with a number of vesicular blebs, edematous in appearance, but also the proper time for removal to the killing fluid must be selected with considerable care. A similar procedure, involving the injection of chloretone into the body-cavity, has been employed by Pearse¹ with holothurians.

The proper penetration of the fixative is of course important for the conservation of the internal organs. This result may be assured if a fair volume of the fixative is employed, and if in addition an incision several centimeters long is made along the edge of the mantle (preferably on the left side) previous to immersion in the fixative.

Frequently it is desirable that the normal integumentary

¹ Pearse, A. S., 1910. Eine Methode, um Holothurien in ausgedehntem Zustande zu konservieren. Zeits. f. biol. Tech. u. Method., Bd. 2, p. 94-95.

colors of the nudibranch should be preserved as faithfully as possible. Two fluids which I have found useful with *Chromodoris zebra* are Merkel's fluid and the sublimate-acetic mixture (saturated aqueous solution of sublimate plus 5 per cent glacial acetic acid). The sublimate mixture in particular gives a very fair preservation of the blue pigment of *Chromodoris*, which is permanent for six months at least, if not for a longer period. The sublimate precipitates the blue substance so that it is no longer soluble in aqueous alcohol, and at the same time renders it insensitive to the acetic acid, which otherwise would cause the substance to become pink. Possibly the platonic chloride in Merkel's fluid has a similar action, since I find that both mercurous salts and platonic chloride precipitate the blue pigment from aqueous solutions.

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H. A. P. AND C. W. J.